UTAH GEOLOGICAL SURVEY
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UTAH DEPARTMENT OF NATURAL RESOURCES
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U.S. GEOLOGICAL SURVEY
National Cooperative Geologic Mapping Program
STATEMAP Agreement 20HQAG0055

Plate 1
Utah Geological Survey Open-File Report 417
Interim Geologic Map of the Little Creek Mountain Quadrangle

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Interim Geologic Map of the Little Creek Mountain Quadrangle, Washington County, Utah

by
Janice M. Hayden
2003

August 18, 2003

Field mapping by author, 2002-2003.
Photogrammetric compilation by author, 2003.
Cartographic preparation by Kent D. Brown.

Description of Map Units

QUATERNARY

Qf **Artificial fill deposits** -- Artificial fill used to create small dams. Consists of engineered fill and general borrow material. Although only a few deposits have been mapped, fill should be anticipated in all built-up areas, many of which are shown on the topographic base map; thickness variable.

Alluvial deposits

Qal **Alluvial-stream deposits** -- Moderately- to well-sorted clay to small gravel deposits in large active drainages; includes terraces up to 30 feet (10 m) above current channels; mapped in the upper portions of Gould Wash in the northeast corner of the quad and along Short Creek in the southeast corner of the quadrangle; 0 to 30 feet (0-10 m) thick.

Eolian deposits

Qes **Eolian-sand deposits** -- Well- to very well-sorted, fine- to coarse-grained, well-rounded, mostly quartz sand; derived primarily from the Shinarump Conglomerate Member of the Chinle Formation; mapped in canyon north of Gray Knoll; deposited on Little Creek flow and mixed alluvial-eolian deposits; 0 to10 feet (0-3 m) thick.

Mass-movement deposits

Qmt **Talus deposits** -- Very poorly sorted, angular boulders with minor fine-grained interstitial sediment; deposited mostly by rockfall on and at the base of steep slopes; occurs primarily as blocks weather from the edges of lava flows and cinder cones and from the Shinarump Conglomerate Member which caps Little Creek Mountain; common on both north and south sides of Little Creek Mountain, but particularly thick along the north side where debris accumulates upslope of the bench formed along the top of landslide masses; gradational with older, mixed alluvial-colluvial deposits farther downslope; 0 to 20 feet (0-6 m) thick.

Qmsy, Qmso

Landslide deposits -- Very poorly sorted clay- to boulder-size, locally derived debris in chaotic, hummocky mounds; form on steep slopes beneath Shinarump Conglomerate Member on Little Creek Mountain; basal detachments develop mostly in Snabkaib and middle red members of the Moenkopi Formation; older deposits are isolated away from the slope as chaotic bedrock debris armored by talus deposits; thickness highly variable.

Mixed-environment deposits

Qae **Mixed alluvial and eolian deposits** -- Moderately to well-sorted, clay- to sand-sized alluvial sediment that locally includes abundant eolian sand and minor gravel; stage II pedogenic carbonate development (Birkeland and others, 1991); mapped in Little Plain and Cannan Gap valleys in the northeast and southeast corners of the quadrangle; 0 to 50 feet (0-30 m) thick.

Qea **Mixed eolian and alluvial deposits** -- Well-sorted eolian sand with minor alluvial clay to gravel; locally reworked by alluvial processes; rests on mixed alluvial-eolian deposits along Short Creek in the southeast corner of the quadrangle; 0 to 10 feet (0-3 m) thick.

Qac, Qaco

Mixed alluvial and colluvial deposits -- Poorly to moderately sorted, clay- to boulder-sized, locally derived sediment deposited in swales and minor drainages; gradational with alluvial and colluvial deposits; older deposits form incised, inactive, gently sloping surfaces gradational with and downslope from talus deposits; includes terrace deposits too small to map separately; 0 to 20 feet (0-6 m) thick.

Basaltic flows and related deposits

Qbgw, Qbgwc, Qec

Gould Wash flow, cinder cones, and associated eolian deposits -- Dark-gray, very fine-grained olivine basalt (Qbgw); abundant olivine phenocrysts; generally 20 to 30 feet (6-9 m) thick; yielded an $^{40}Ar/^{39}Ar$ age of 0.278+ 0.018 Ma (Downing, 2000); erupted from two cinder cones (Qbgwc) near the center of the north edge of the quadrangle, the flow continues north and west of the map area; cinder pits in both cones; Qec denotes partial cover of eolian sand and pedogenic carbonate up to several feet thick, flow 0 to 30 feet (0-9 m) thick.

Qblc, Qblcc, Qblcs

Little Creek flow, cinder cone, and spatter cones -- Medium-gray, fined-grained basalt to trachybasalt with sparse olivine (Qblc); flow to the northeast of the cinder cone cascaded off of Little Creek Mountain, partially filling in the small canyon south of Little Plain valley; Qblcc denotes Gray Knoll cinder cone, which has several cinder pits; Qblcs denotes a line of spatter cones that trend mostly northwest, but also southeast from Gray Knoll; the cones line up with the principal joint direction in the underlying Shinarump Conglomerate Member of the Chinle Formation forming mostly a double row of spatter cones along three distinct joints, stepping successively to the west; yielded an $^{40}Ar/^{39}Ar$ age of 0.345+0.015 Ma (Downing, 2000); 0 to 40 feet (0-12 m) thick.

unconformity

TRIASSIC
Chinle Formation

TRcs **Shinarump Conglomerate Member of the Chinle Formation** -- Varies from a grayish-orange to moderate-yellowish-brown, medium- to coarse-grained sandstone with locally well-developed limonite bands ("picture rock" or "landscape stone") to a moderate-brown, pebble conglomerate with subrounded clasts of quartz, quartzite, and chert; mostly thick- to very thick-bedded with both planar and low-angle cross-stratification; contains poorly preserved petrified wood fragments; forms the dark-brown to moderate-yellowish-brown caprock of Little Creek Mountain above the Moenkopi Formation, capping the "Chocolate Cliffs" layer of the Grand Staircase of rock; variable in composition and thickness because it represents stream-channel deposition over paleotopography; ranges from 75 to 175 feet (23-53 m) thick.

unconformity (TR-3)

Moenkopi Formation

TRmu **Upper red member of the Moenkopi Formation** -- Moderate-reddish-brown, thin-bedded siltstone and very fine-grained sandstone with some thin gypsum beds and abundant discordant gypsum stringers; ripplemarks common in the siltstone; forms a steep slope with a few sandstone ledges; locally includes 20-foot-thick (6 m) fine-grained, resistant sandstone near base; 400 feet (120 m) thick.

TRms **Shnabkaib Member of the Moenkopi Formation** -- Light-gray to pale-red, gypsiferous siltstone with bedded gypsum and several thin interbeds of dolomitic, unfossiliferous limestone near the base; upper portion is very gypsiferous and weathers to a powdery soil; forms ledge-slope "bacon-striped" topography; prone to landsliding; thickens eastward across the quadrangle; 350 to 500 feet (105-150 m) thick.

TRmm **Middle red member of the Moenkopi Formation** -- Interbedded moderate-red to moderate-reddish-brown siltstone, mudstone, and thin-bedded, very fine-grained sandstone with thin interbeds and veinlets of greenish-gray to white gypsum; forms slope with several ledge- forming gypsum beds near base; 450 feet (135 m) thick.

TRmv **Virgin Limestone Member of the Moenkopi Formation** -- Three distinct medium-gray to yellowish-brown shallow-marine limestone ledges interbedded with nonresistant, moderate-yellowish-brown, muddy siltstone, pale-reddish-brown sandstone, and light-gray to grayish-orange-pink gypsum; limestone beds are typically 5 to 10 feet (1.5-3 m) thick and contain five-sided echinoderms and *Composita* brachiopods (Billingsley, 1992); total thickness is generally 150 feet (45 m).

TRml **Lower red member of the Moenkopi Formation** -- Moderate-reddish-brown siltstone, mudstone, and fine-grained, slope-forming sandstone; generally calcareous and has interbeds and stringers of gypsum; ripple marks and small-scale cross-beds are common in the siltstone; 250 feet (75 m) thick.

TRmt **Timpoweap Member of the Moenkopi Formation** -- Lower part is light-gray to grayish-orange, thin- to thick-bedded limestone and cherty limestone that weathers light-brown with a rough, "meringue like" surface due to blebs of chert; contains ammonites, gastropods, and brachiopods; occasional euhedral pyrite crystals up to 1/4 inch (1 cm). Upper part is grayish-orange, thin- to thick-bedded, slightly calcareous, very fine-grained sandstone with thin-bedded siltstone and mudstone intervals; weathers yellowish-brown; forms a coherent ledge or low cliff; thickness 100 feet (30 m).

Subsurface Units

Pzu **Paleozoic, undivided** — shown in cross section only.

References

Billingsley, G.H., 1992, Geologic map of the Yellowhorse Flat quadrangle, northern Mohave County, Arizona: U.S. Geological Survey Open-File Report OF92-442, scale 1:24,000.

Birkeland, P.W., Machette, M.N., and Haller, K.M., 1991, Soils as a tool for applied Quaternary geology: Utah Geological and Mineral Survey, Miscellaneous Publication 91-3, 63 p.

Downing, R.F., 2000, Imaging the mantle in southwestern Utah using geochemistry and geographic information systems: Las Vegas, University of Nevada, MS thesis, 128 p.

Geologic Map Symbols

- Contact
- Concealed high-angle normal fault; bar-and-ball on down-thrown side
- Strike and dip of inclined bedding
- Approximate strike and dip of inclined bedding; determined from stereoplotter
- Strike of vertical joint
- Pit - cinders (c)
  sand and gravel (no letter)
- Quarry - sandstone
- Adit
- Cinder cone
- Spatter cone
- Sample location and number
  LC 111902-3
- Spring

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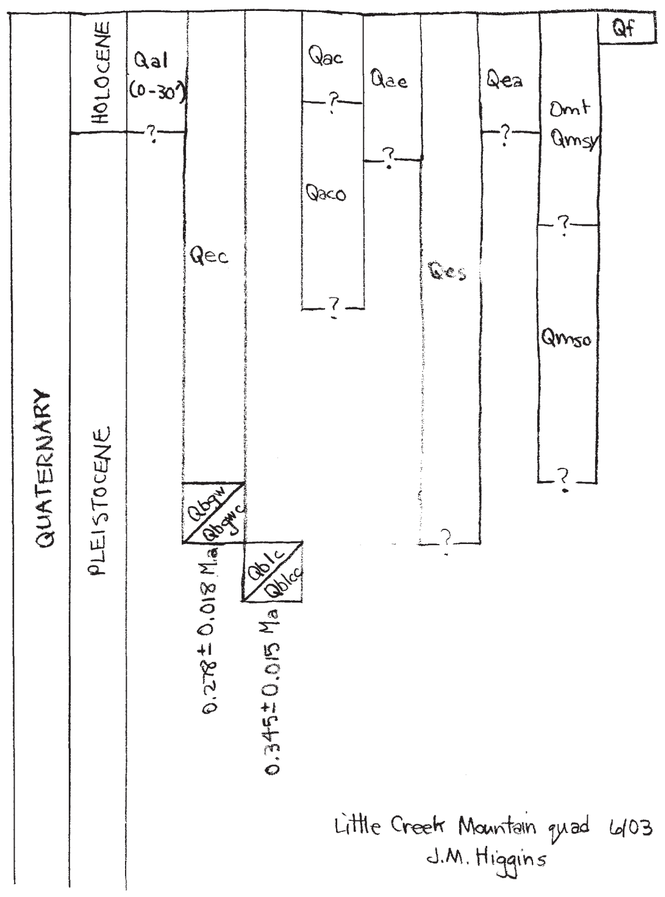
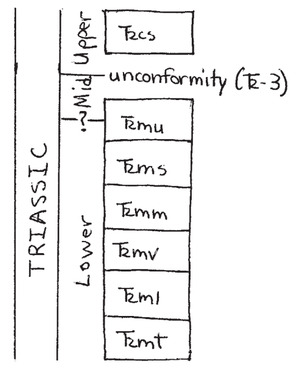
CORRELATION OF QUATERNARY UNITS



Little Creek Mountain quad 6/03
J.M. Higgins

CORRELATION OF BEDROCK UNITS



Little Creek Mountain quad 6/03 JMH

Stratigraphic Column - Little Creek Mountain - J.M. Higgins 6/03